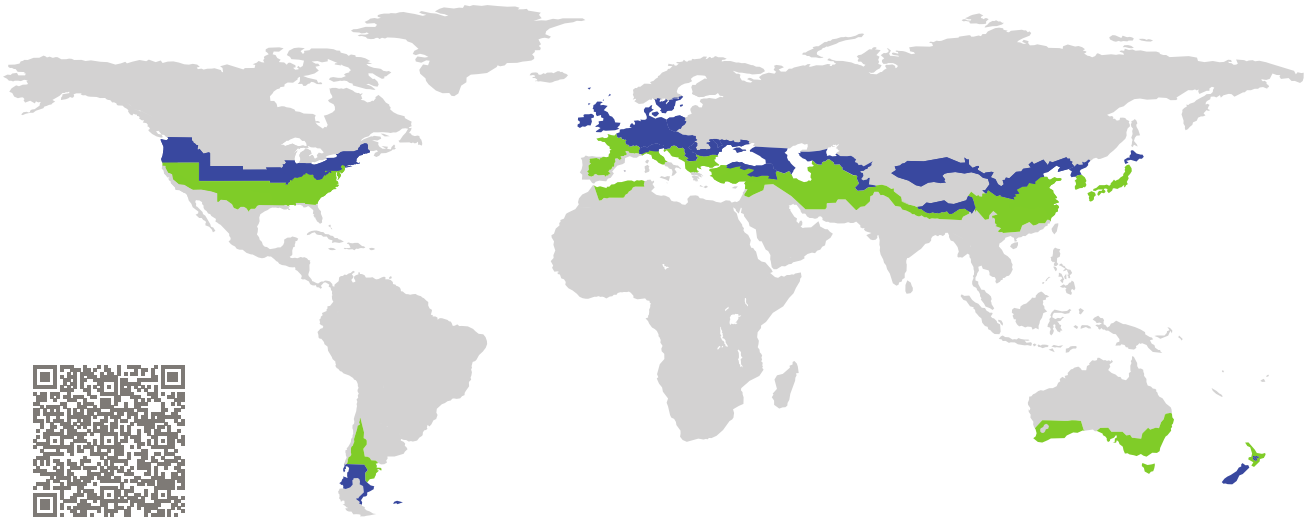
CERTIFICATE

Certified Passive House Component

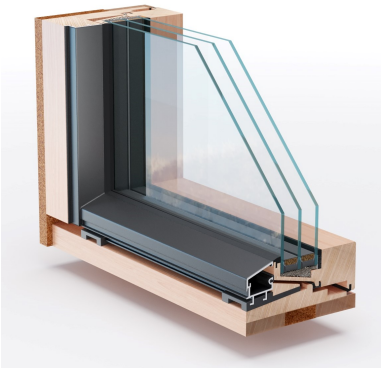
Component-ID 1894ws03 valid until 31st December 2023

Passive House Institute
Dr. Wolfgang Feist
64283 Darmstadt
Germany



Category:	**Window system**
Manufacturer:	**pro Passivhausfenster GmbH, Oberaudorf, Germany**
Product name:	**smartwin solar**

This certificate was awarded based on the following criteria for the cool, temperate climate zone



Comfort	$U_W = 0.78$	$\leq$	0.80 W/(m² · K)
	$U_{W,\text{installed}}$	$\leq$	0.85 W/(m² · K)
	with U_g	=	0.70 W/(m² · K)
Hygiene	$f_{Rsi=0.25}$	$\geq$	0.70
Airtightness	$Q_{100} = 0.24$	$\leq$	0.25 m³/(h · m)

cool, temperate climate

phA

CERTIFIED COMPONENT

Passive House Institute

Passive House efficiency class	phE	phD	phC	phB	phA

www.passivehouse.com

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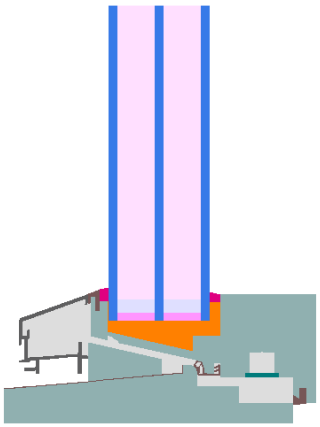
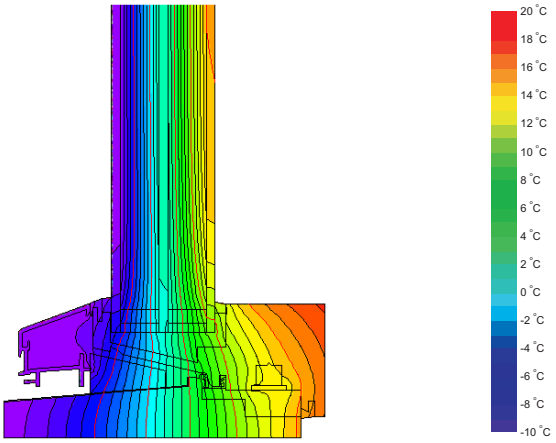
☎ +49 8033 / 30 40 98 | ✉ ff@propassivhausfenster.net | http://www.propassivhausfenster.net |



Calculation model



Isothermal

Description

Timber-Aluminum window frame (spruce/fir 0.11 W/(mK) with natural insulation (0.04 W/(mK). Glass loads are caried by special corner pieces. The airtightness test was conducted on a combination of fixed glazing and tilt and turn sash, element size 2.0m * 2.6m. The window installation will be designed individually by the manufacturer. Pane thickness: 48 mm (4/18/4/18/4), rebate depth: 15 mm. Spacer: SWISSPACER Ultimate.

Explanation

The window U-values were calculated for the test window size of 2.46 m × 1.48 m with U_g = 0.70 W/(m^2 · K). If a higher quality glazing is used, the window U-values will improve as follows:

Glazing	U_g =	0.70	0.64	0.58	0.52	W/(m^2 · K)
		↓	↓	↓	↓	
Window	U_W =	0.78	0.73	0.68	0.63	W/(m^2 · K)

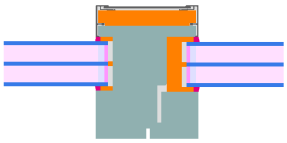
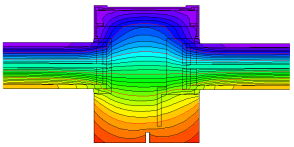
Transparent building components are classified into efficiency classes depending on the heat losses through the opaque part. The frame U-Values, frame widths, thermal bridges at the glazing edge, and the glazing edge lengths are included in these heat losses. A more detailed report of the calculations performed in the context of certification is available from the manufacturer.
The Passive House Institute has defined international component criteria for seven climate zones. In principle, components which have been certified for climate zones with higher requirements may also be used in climates with less stringent requirements. In a particular climate zone it may make sense to use a component of a higher thermal quality which has been certified for a climate zone with more stringent requirements.

Further information relating to certification
can be found on www.passivehouse.com and passipedia.org.

Frame values			Frame width b_f mm	U-value frame U_f W/(m² · K)	Ψ-glazing edge Ψ_g W/(m · K)	Temp. Factor $f_{Rsi=0.25}$ [-]
Mullion Fixed	(0M1)		110	0.69	0.028	0.71
Transom Fixed	(0T1)		110	0.74	0.027	0.70
Mullion 1 casement	(1M1)		80	0.84	0.027	0.71
Mullion 1 casement	(1M2)		110	0.78	0.027	0.71
Transom 1 casement	(1T1)		80	0.83	0.027	0.70
Transom 1 casement	(1T2)		110	0.83	0.028	0.70
Mullion 2 casements	(2M1)		110	0.75	0.026	0.72
Transom 2 casements	(2T1)		110	0.81	0.026	0.72
Transom 2 casements	(2T2)		124	0.81	0.026	0.71
Bottom Fixed	(FB1)		62	0.68	0.028	0.71
Top Fixed	(FH1)		62	0.67	0.027	0.72
Lateral Fixed	(FJ1)		62	0.67	0.027	0.72
Flying Mullion	(FM1)		92	0.76	0.026	0.72
Bottom	(OB1)		62	0.84	0.026	0.71
Top	(OH1)		62	0.77	0.026	0.72
Lateral	(OJ1)		62	0.77	0.026	0.72
Threshold	(OT1)		67	0.91	0.027	0.70
Spacer: MULTITECH G				Secondary seal: Polysulfid		

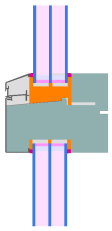
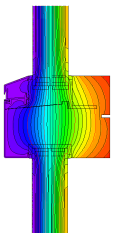
Mullion Fixed

b_f = 110 mm
U_f = 0.69 W/(m^2 · K)
Ψ_g = 0.028 W/(m · K)
f_{Rsi} = 0.71

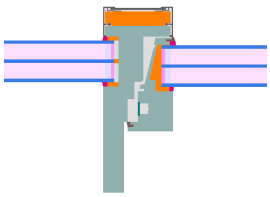
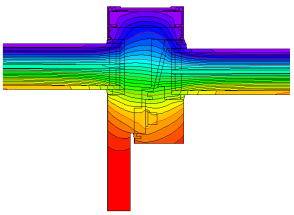
Transom Fixed

b_f = 110 mm
U_f = 0.74 W/(m^2 · K)
Ψ_g = 0.027 W/(m · K)
f_{Rsi} = 0.70

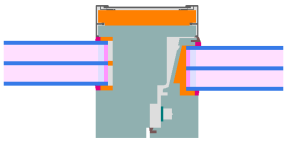
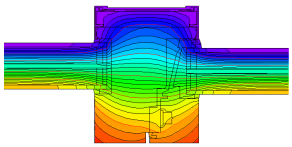
Mullion 1 casement

b_f = 80 mm
U_f = 0.84 W/(m^2 · K)
Ψ_g = 0.027 W/(m · K)
f_{Rsi} = 0.71

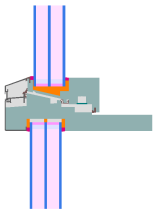
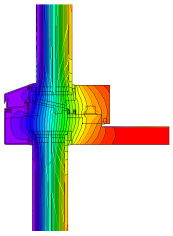
Mullion 1 casement

b_f = 110 mm
U_f = 0.78 W/(m^2 · K)
Ψ_g = 0.027 W/(m · K)
f_{Rsi} = 0.71

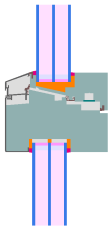
Transom 1 casement

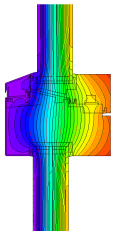
b_f = 80 mm
U_f = 0.83 W/(m^2 · K)
Ψ_g = 0.027 W/(m · K)
f_{Rsi} = 0.70

Transom 1 casement

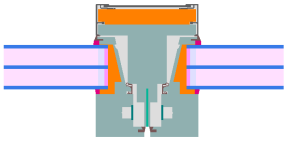
b_f = 110 mm
U_f = 0.83 W/(m^2 · K)
Ψ_g = 0.028 W/(m · K)
f_{Rsi} = 0.70

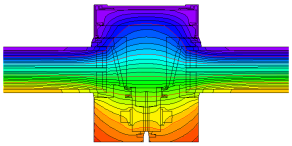




Mullion 2 casements

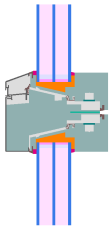
b_f = 110 mm
U_f = 0.75 W/(m^2 · K)
Ψ_g = 0.026 W/(m · K)
f_{Rsi} = 0.72

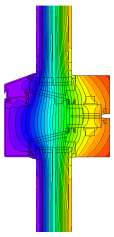




Transom 2 casements

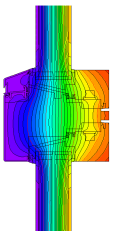
b_f = 110 mm
U_f = 0.81 W/(m^2 · K)
Ψ_g = 0.026 W/(m · K)
f_{Rsi} = 0.72





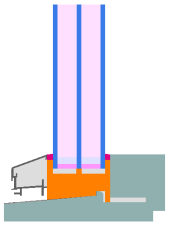
Transom 2 casements

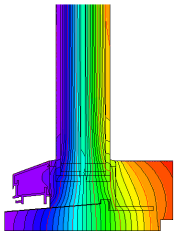
b_f = 124 mm
U_f = 0.81 W/(m^2 · K)
Ψ_g = 0.026 W/(m · K)
f_{Rsi} = 0.71



Bottom Fixed

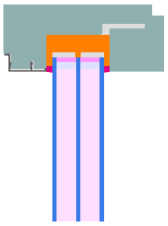
b_f = 62 mm
U_f = 0.68 W/(m^2 · K)
Ψ_g = 0.028 W/(m · K)
f_{Rsi} = 0.71

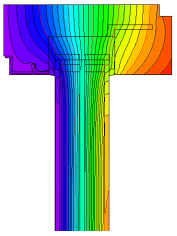




Top Fixed

b_f = 62 mm
U_f = 0.67 W/(m^2 · K)
Ψ_g = 0.027 W/(m · K)
f_{Rsi} = 0.72



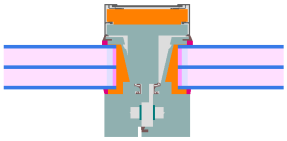


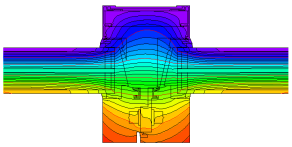
Lateral Fixed

b_f = 62 mm
U_f = 0.67 W/(m^2 · K)
Ψ_g = 0.027 W/(m · K)
f_{Rsi} = 0.72

Flying Mullion

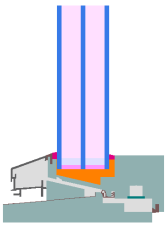
b_f = 92 mm
U_f = 0.76 W/(m^2 · K)
Ψ_g = 0.026 W/(m · K)
f_{Rsi} = 0.72

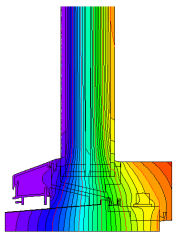




Bottom

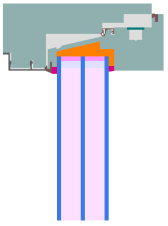
b_f = 62 mm
U_f = 0.84 W/(m^2 · K)
Ψ_g = 0.026 W/(m · K)
f_{Rsi} = 0.71

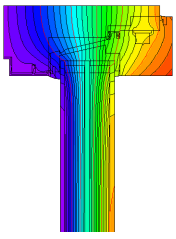




Top

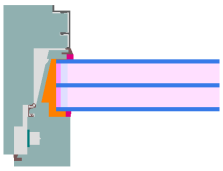
b_f = 62 mm
U_f = 0.77 W/(m^2 · K)
Ψ_g = 0.026 W/(m · K)
f_{Rsi} = 0.72

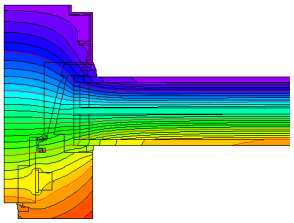




Lateral

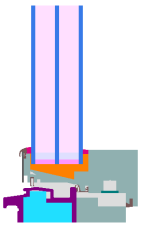
b_f = 62 mm
U_f = 0.77 W/(m^2 · K)
Ψ_g = 0.026 W/(m · K)
f_{Rsi} = 0.72





Threshold

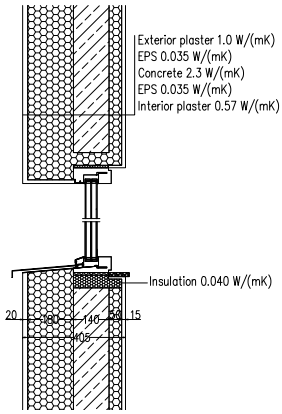
b_f = 67 mm
U_f = 0.91 W/(m^2 · K)
Ψ_g = 0.027 W/(m · K)
f_{Rsi} = 0.70



Validated installations

Formwork blocks (fixed)

U_{Wall} = 0.15 W/(m² · K)

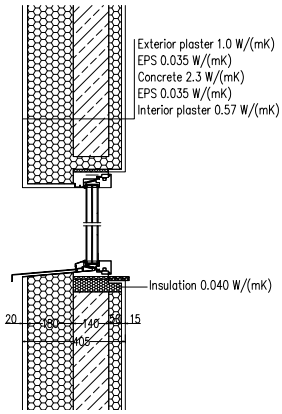


$\Psi_{install}$	W/(m · K)
Top	0.013
Left	0.013
Right	0.013
Bottom	0.024

$U_{W,installed}$ = 0.82 W/(m² · K)

Formwork blocks (operable)

U_{Wall} = 0.15 W/(m² · K)

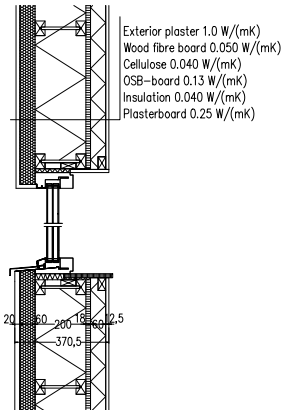


$\Psi_{install}$	W/(m · K)
Top	0.013
Left	0.013
Right	0.013
Bottom	0.026

$U_{W,installed}$ = 0.82 W/(m² · K)

Lightweight timber (fixed glazed)

U_{Wall} = 0.13 W/(m² · K)

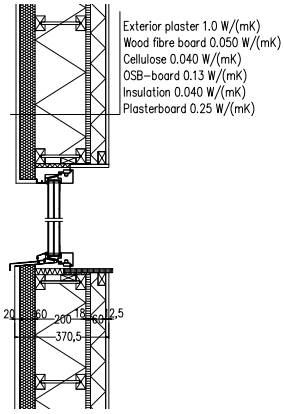


$\Psi_{install}$	W/(m · K)
Top	0.015
Left	0.015
Right	0.015
Bottom	0.018

$U_{W,installed}$ = 0.82 W/(m² · K)

Lightweight timber (operable)

U_{Wall} = 0.13 W/(m² · K)

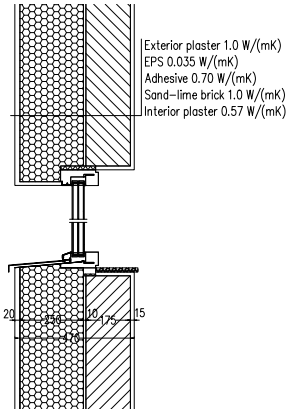


$\Psi_{install}$	W/(m · K)
Top	0.015
Left	0.015
Right	0.015
Bottom	0.020

$U_{W,installed}$ = 0.82 W/(m² · K)

Exterior insulation and finishing system (EIFS) (fixed glazed)

U_{Wall} = 0.13 W/(m² · K)

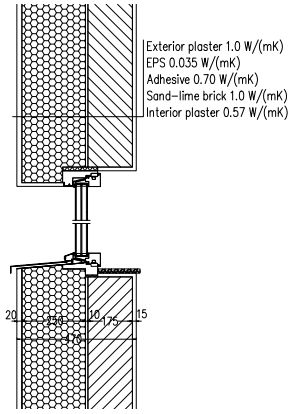


$\Psi_{install}$	W/(m · K)
Top	0.017
Left	0.017
Right	0.017
Bottom	0.019

$U_{W,installed}$ = 0.82 W/(m² · K)

Exterior insulation and finishing system (EIFS) (operable)

U_{Wall} = 0.13 W/(m² · K)

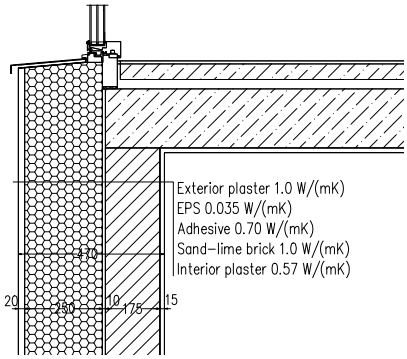


$\Psi_{install}$	W/(m · K)
Top	0.018
Left	0.018
Right	0.018
Bottom	0.022

$U_{W,installed}$ = 0.83 W/(m² · K)

Exterior insulation and finishing s (EIFS) threshold (operable)

U_1 = 0.13 [W/(m^2 · K)]



$\Psi_{install}$ = 0.03 W/(m · K)